

PROGRESS REPORT

April-September 2004

Variability of Warm Season Floods in the Southwest United States: Diagnosis, Impacts, and Applications for Water and Adaptive Environmental Management

Work during the first half-year of the project has focused on coordination of research activities, identifying specific data needs, and diagnostics work investigating the climate-flood-sediment relationships in the Southwest on multiple time scales, with special focus on Paria River region.

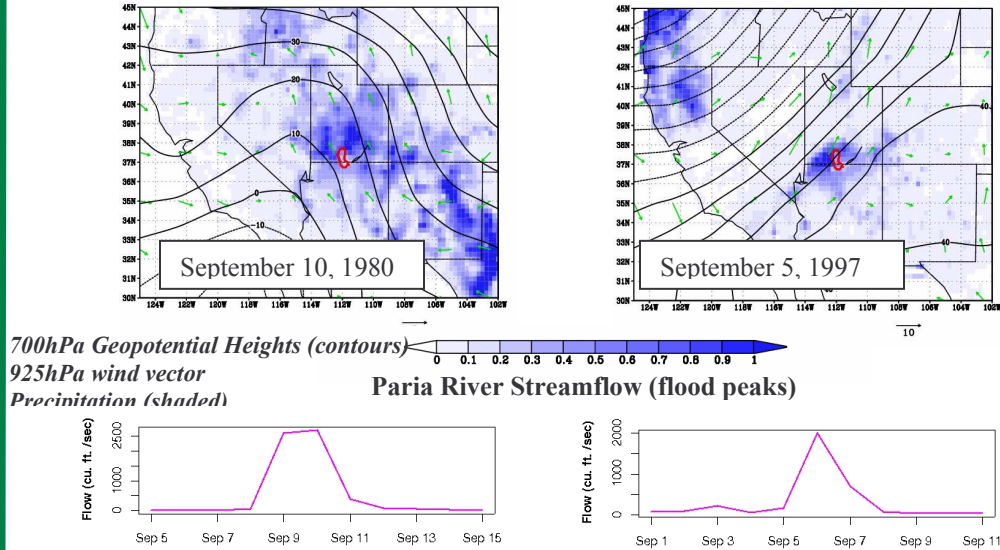
The research team met at the Grand Canyon Monitoring and Research Center during the second week of September (Jain, Pulwarty, Melis, and Topping) and identified the data needs. GCMRC group has since developed a new long-term dataset for the Paria River flow and sediment, suitable for project research.

Preliminary Diagnostics Studies

1. Analysis of regional atmospheric circulation presaging select flooding events over the Paria River shows multiple moisture sources influencing the Grand Canyon region during the July-October season. Ongoing research is investigating the relative contribution of moisture from candidate sources—Eastern tropical Pacific cyclones, Gulf of Mexico, and subtropical and North Pacific.
2. Analysis of 3-day maximum streamflow flood peaks was investigated for the western US region. Leading spatial pattern (principal component) of warm season (July-Sep) floods shows season-ahead (April-June) precursors in the tropical and North Pacific sea surface temperatures and geopotential heights. This provides a useful basis to pursue season-ahead flood forecasting diagnostics and modeling studies for the southwest, with special emphasis on spatial scales relevant to the information needs for the Glen Canyon Dam Adaptive Management Program.

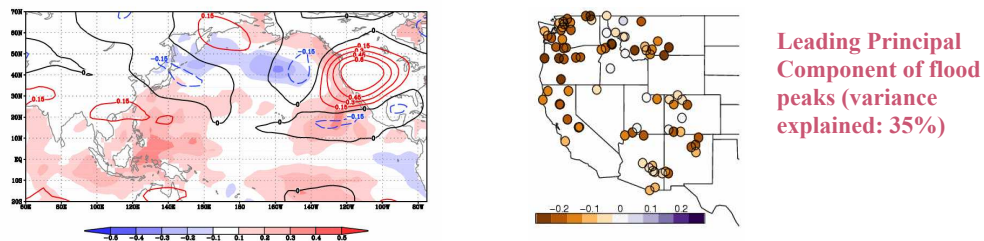
WARM SEASON STORMS, FLOODS, AND SEDIMENT

Multiple tropical and subtropical moisture sources re responsible for the flood and sediment input episodes into the Grand Canyon



Season-ahead large-scale climate and flood potential

Leading principal component pattern of regional flood peaks (July-September) shows local-to-regional associations with the April-June atmospheric regime (500hPa) and Indo-Pacific sea surface temperature.



Ongoing Research (Year 1)

Ongoing research is focusing on large-scale diagnostics studies that relate seasonal and longer climate variability to precipitation and flood potential in the Southwest. Preliminary results presented above provide a basis to understand the space and time scales of warm season hydrology in the Southwest. A case study that maps the diagnosis of climate and hydrologic variations to GCDAMP decision processes is also planned.

For the Paria River basin, detailed analysis of the flow and sediment variations over the 20th century will be investigated. Sensitivity of the flood-sediment relationship to climate is an

important consideration towards developing regional sediment yield relationships for the Grand Canyon region.

Presentations

Jain, S., R. S. Pulwarty, and T. Melis, Diagnosis and Impacts of Warm Season Storms, Floods and Sediment Inputs into the Middle Colorado River: Applications to Decision Making and Adaptive Management in the Grand Canyon Region. 1st International CLIVAR Science Conference, June 21-25, 2004, Baltimore, MD USA.

Jain, S., R. S. Pulwarty, and T. Melis, D. Topping, Warm Season Storms, Floods, and Sediment Inputs into the Grand Canyon: Applications to Decision Making and Adaptive Management. NOAA/NASA GAPP Pls Meeting, Boulder, Colorado, August 2004.

Jain, S., R. S. Pulwarty, D. Topping, and T. Melis, Climate-Related Flood and Sediment Transport From the Paria River to Grand Canyon: The Role of Multiple Time Scales. Session: Managed Rivers as Large-Scale Experiments in Geomorphic Processes. AGU Fall Meeting, San Francisco, December 2004.